

Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

1. (Currently Amended) A transmission and reception system comprising a transmission device and, a receiving device, and a communication pathway between said transmission device and said receiving device, said transmission device comprising:

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) puncturing means for puncturing said convolution-coded data using puncturing patterns, and outputting punctured data; and

(3) modulation / transmission means for modulating and transmitting said punctured data, and

said receiving device comprising:

(1) reception / demodulation means for receiving and demodulating a signal transmitted by said transmission device, and outputting demodulated data;

(2) depuncturing means for depuncturing said demodulated data using said puncturing patterns used by said puncturing means, and outputting depunctured data;

(3) combining means for combining said depunctured data, and outputting a result of combining; and

(4) convolutional decoding means for convolution-decoding said result of combining, and outputting a decoded data,

wherein said puncturing means provides a reference matrix for generating a plural form of said puncturing patterns having an identical puncturing rate, but respectively different block patterns.

2. (Currently Amended) A ~~time-diversity~~ transmission and reception system comprising:

a transmission device including:

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) first multiple puncturing pattern generation means for generating a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) first puncturing means for puncturing convolution-coded data output by said ~~first~~ convolutional coding means by using each of said plural form of puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting a plural form of punctured data;

~~(4) diversity transmission timing control means for outputting a diversity transmission timing control signal for carrying out transmission for a plural number of times;~~

~~(5)~~(4) ~~time diversity~~ modulation / transmission means for modulating and transmitting, ~~as diversity transmission data,~~ said each form of punctured data output by said first puncturing means by using each of branches, as transmission data in response to ~~said diversity transmission timing control signal,~~ and

a receiving device including:

~~(1) diversity reception timing control means for outputting a predetermined diversity reception timing control signal for carrying out reception of a signal transmitted with time diversity transmission;~~

~~(2)~~(1) ~~time diversity~~ reception / demodulation means for receiving and demodulating each of the signals transmitted by said transmission device by using each of branches, ~~in response to said diversity reception timing control signal,~~ and outputting demodulated data;

~~(3)~~(2) second multiple puncturing pattern generation means for generating a plural form of puncturing patterns, which are identical to the puncturing patterns generated by said first multiple puncturing pattern generation means;

~~(4)~~(3) first depuncturing means for depuncturing ~~the each of~~ demodulated data in quantity corresponding to the number of said branches output from said ~~time-diversity~~ reception / demodulation means by using the puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting depunctured data;

~~(5)~~(4) first combining means for combining ~~the each of~~ depunctured data output by said first depuncturing means, symbol by symbol in a unit of block, and outputting a result of combining; and

~~(6)~~(5) first convolutional decoding means for convolution-decoding said result of combining, and outputting decoded data,

wherein said ~~time-diversity~~ transmission and reception system executes ~~time-diversity~~ transmission and reception of a plurality of different error-correction code words, as individual ~~diversity~~ branch data, obtained by puncturing and convolution-coding identical series of information data with the plurality of different forms of puncturing patterns.

3.-24. (Canceled)

25. (New) The transmission and reception system according to claim 2, wherein:

said each form of punctured data output by said first puncturing means are transmitted by using each of branches of space-diversity.

26. (New) The transmission and reception system according to claim 2, wherein:

said each form of punctured data output by said first puncturing means are transmitted by using each of branches of frequency-diversity.

27. (New) The transmission and reception system according to claim 2, wherein:

said each form of punctured data output by said first puncturing means are transmitted by using each of branches of code division multiplex.

28. (New) The transmission and reception system according to claim 2, wherein:

(1) said demodulated data output by said reception / demodulation means are digital values quantized with a predetermined number of bits;

(2) said depuncturing carried out by said first depuncturing means includes inserting a middle value between two digital values corresponding to a mark and a space;

(3) said combining by said first combining means is a process of addition of a digital value to said series of depunctured data output by said first depuncturing means, symbol by symbol in a unit of a block; and

(4) said first convolutional decoding means defines Viterbi soft quantization means for executing a Viterbi soft decision.

29. (New) The transmission and reception system according to claim 25, wherein:

(1) said demodulated data output by said reception / demodulation means are digital values quantized with a predetermined number of bits;

(2) said depuncturing carried out by said first depuncturing means includes inserting a middle value between two digital values corresponding to a mark and a space;

(3) said combining by said first combining means is a process of addition of a digital value to said series of depunctured data output by said first depuncturing means, symbol by symbol in a unit of a block; and

(4) said first convolutional decoding means defines Viterbi soft quantization means for executing a Viterbi soft decision.

30. (New) The transmission and reception system according to claim 26, wherein:

(1) said demodulated data output by said reception / demodulation means are digital values quantized with a predetermined number of bits;

(2) said depuncturing carried out by said first depuncturing means includes inserting a middle value between two digital values corresponding to a mark and a space;

(3) said combining by said first combining means is a process of addition of a digital value to said series of depunctured data output by said first depuncturing means, symbol by symbol in a unit of a block; and

(4) said first convolutional decoding means defines Viterbi soft quantization means for executing a Viterbi soft decision.

31. (New) The transmission and reception system according to claim 27, wherein:

(1) said demodulated data output by said reception / demodulation means are digital values quantized with a predetermined number of bits;

(2) said depuncturing carried out by said first depuncturing means includes inserting a middle value between two digital values corresponding to a mark and a space;

(3) said combining by said first combining means is a process of addition of a digital value to said series of depunctured data output by said first depuncturing means, symbol by symbol in a unit of a block; and

(4) said first convolutional decoding means defines Viterbi soft quantization means for executing a Viterbi soft decision.

32. (New) The transmission and reception system according to claim 2, wherein puncturing locations in said puncturing patterns generated by said first multiple puncturing pattern generation means are set in a manner not to overlap among said patterns.

33. (New) The transmission and reception system according to claim 25, wherein puncturing locations in said puncturing patterns generated by said first multiple puncturing pattern generation means are set in a manner not to overlap among said patterns.

34. (New) The transmission and reception system according to claim 26, wherein puncturing locations in said puncturing patterns generated by said first multiple puncturing pattern generation means are set in a manner not to overlap among said patterns.

35. (New) The transmission and reception system according to claim 27, wherein puncturing locations in said puncturing patterns generated by said first multiple puncturing pattern generation means are set in a manner not to overlap among said patterns.

36. (New) A transmission and reception system comprising:

a transmission device including:

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) first multiple puncturing pattern generation means for generating a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) first puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said plural form of puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting a plural form of punctured data;

(4) modulation / transmission means for modulating and transmitting said each form of punctured data output by said first puncturing means by using each of branches, as transmission data, and

a receiving device including:

(1) reception / demodulation means for receiving and demodulating each of the signals transmitted by said transmission device by using each of branches, and outputting demodulated data;

(2) second multiple puncturing pattern generation means for generating a plural form of puncturing patterns, which are identical to the puncturing patterns generated by said first multiple puncturing pattern generation means;

(3) first depuncturing means for depuncturing each of demodulated data in quantity corresponding to the number of said branches output from said reception / demodulation means by using the puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting depunctured data;

(4) first combining means for combining each of depunctured data output by said first depuncturing means, symbol by symbol in a unit of block, and outputting a result of combining; and

(5) first convolutional decoding means for convolution-decoding said result of combining, and outputting decoded data,

wherein said transmission and reception system executes transmission and reception of a plurality of different error-correction code words, as individual branch data, obtained by puncturing and convolution-coding identical series of information data with the plurality of different forms of puncturing patterns, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plurality of branches by converting at least one of rows, columns and elements of said reference matrix.

37. (New) The transmission and reception system according to claim 36, wherein said second multiple puncturing pattern generation means comprises second reference matrix generation means having the same function as said first reference matrix generation means, and a second matrix conversion means having the same function as said first matrix conversion means with relation to a further reference matrix generated by said second reference matrix generation means.

38. (New) A transmission and reception system comprising:

a transmission device including:

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) first multiple puncturing pattern generation means for generating a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) first puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said plural form of puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting a plural form of punctured data;

(4) modulation / transmission means for modulating and transmitting, said each form of punctured data output by said first puncturing means by using each of branches, as transmission data, and

a receiving device including:

(1) reception / demodulation means for receiving and demodulating each of the signals transmitted by said transmission device by using each of branches, and outputting demodulated data;

(2) reception level memory means for measuring a reception level at every branches in said reception / demodulation means, and storing a result of measurement;

(3) second multiple puncturing pattern generation means for generating a plural form of puncturing patterns, which are identical to the puncturing patterns generated by said first multiple puncturing pattern generation means;

(4) first depuncturing means for depuncturing each of demodulated data in quantity corresponding to the number of said branches output from said reception / demodulation means by using the puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting depunctured data;

(5) weighting / combining means for i) weighing and ii) then combining the depunctured data output by said first depuncturing means according to the reception level for each of said reception level stored in said reception level memory means, and outputting a result of combining; and

(6) first convolutional decoding means for convolution-decoding said result of combining, and outputting decoded data,

wherein said time-diversity transmission and reception system executes transmission and reception of a plurality of different error-correction code words, as individual branch data, obtained by puncturing and convolution-coding identical series of information data with the plurality of different forms of puncturing patterns, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plurality of branches by converting at least one of rows, columns and elements of said reference matrix.

39. (New) A transmission and reception system, comprising a transmission device and a receiving device, said transmission device comprising:

(1) first convolutional coding means for outputting input data by convolution-coding said data;

(2) first multiple puncturing pattern generation means for generating a plural form of predetermined puncturing patterns having an identical puncturing rate, but respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) first puncturing means for puncturing convolution-coded data output by said first convolutional coding means by using each of said puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting punctured data;

(4) first code division multiplex signal transmission means for simultaneously transmitting said punctured data by code division multiplexing, and

said receiving device comprising:

(1) first code division multiplex signal reception means for receiving and demodulating a signal transmitted with said code division multiplexing, and outputting multiplexed demodulated data;

(2) second multiple puncturing pattern generation means for generating puncturing patterns, which are identical to the predetermined plural output from said first code division multiplex signal reception means by using the puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting depunctured data;

(4) first combining means for combining the depunctured data output by said first depuncturing means, symbol by symbol in a unit of a block, and outputting a result of combining; and

(5) first convolutional decoding means for convolution-decoding said result of combining, and outputting a decoded data,

wherein said transmission and reception system executes code division multiplex transmission and reception of error-correction code words obtained by puncturing and convolution-coding identical series of information data with the puncturing patterns, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

40. (New) A transmission and reception system according to comprising a plurality of transmission devices and a receiving device, each of said plurality of transmission devices comprising:

(1) convolutional coding means for convolution-coding and outputting said input data;

(2) puncturing pattern generation means for generating a puncturing pattern having an identical puncturing rate, but having a different puncturing block pattern from a puncturing pattern generated in any other of said plurality of transmission devices, said

puncturing pattern generation means providing a reference matrix from which is generated said puncturing pattern;

(3) puncturing means for puncturing a series of convolution-coded data output by said convolutional coding means by using the puncturing pattern supplied by said puncturing pattern generation means, and outputting a series of punctured data;

(4) first transmission control means for outputting information of a predetermined transmission timing and a predetermined transmission frequency for said transmission device to execute a transmission; and

(5) modulation / transmission means for modulating and transmitting said series of punctured data in response to said information of transmission timing and transmission frequency, and

said receiving device comprising:

(1) first reception control means for supplying information of a predetermined reception timing and a predetermined reception frequency for carrying out reception of individual signals transmitted by each of said plurality of transmission devices in said predetermined transmission timing and said predetermined transmission frequency;

(2) reception / demodulation means for receiving and demodulating the signal transmitted by each of said transmission devices in response to information of said predetermined reception timing and said predetermined reception frequency supplied from said first reception control means, and outputting demodulated data;

(3) multiple puncturing pattern generation means for generating puncturing patterns, which are identical to the individual puncturing patterns of said plurality of transmission devices;

(4) depuncturing means for depuncturing each of the demodulated data output by said first reception / demodulation means by using a puncturing pattern that is identical to the puncturing pattern used by each of said plurality of transmission devices among said puncturing patterns supplied from said multiple puncturing pattern generation means, and outputting depunctured data;

(5) combining means for combining said depunctured data output by said second depuncturing means, symbol by symbol in a unit of a block, and outputting a result of combining; and

(6) convolutional decoding means for convolution-decoding said result of combining,

wherein said transmission and reception system sets said transmission frequencies approximately equal and selects said transmission timings with said transmission control means in a manner not to overlap among said plurality of transmission devices, and executes transmissions having different timings with respect to one another by punctured-convolution-coding of said information data individually with different puncturing patterns when transmitting said data by said plurality of transmission devices; and

said puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural transmission devices by converting at least one of rows, columns and elements of said reference matrix.

41. (New) The transmission and reception system according to claim 40, wherein said transmission control means i) sets transmission timings to be approximately equal and ii) selects transmission frequencies in a such manner not to overlap among said plurality of transmission devices, and

said reception control means sets said reception timings and said reception frequencies in advance to correspond with said transmission timings and said transmission frequencies of said transmission control means.

42. (New) The transmission and reception system according to claim 40, wherein both said transmission timings and said transmission frequencies are set in advance in a such manner not to overlap among said plurality of transmission devices; and

said reception timings and said reception frequencies are set in advance to correspond with said transmission timings and said transmission frequencies of said transmission control means.

43. (New) A transmission and reception system comprising a plurality of transmission devices and a receiving device, each of said plurality of transmission device comprising:

(1) convolutional coding means for convolution-coding and outputting said input data;

(2) puncturing pattern generation means for generating a puncturing pattern having an identical puncturing rate, but having a different puncturing block pattern from a puncturing block pattern generated in any other of said plurality of transmission devices, said puncturing pattern generation means providing a reference matrix from which is generated said puncturing pattern;

(3) puncturing means for puncturing a series of convolution-coded data output by said second convolutional coding means by using the puncturing pattern supplied by said first puncturing pattern generation means, and outputting a series of punctured data;

(4) transmission control means for outputting information of a predetermined transmission timing and a predetermined transmission frequency for said transmission device to execute a transmission, both said transmission timings and said transmission frequencies are set in advance to be approximately equal among said plurality of transmission devices; and

(5) code division multiplex signal transmission means for modulating and transmitting said series of punctured data output by said second puncturing means with code division multiplexing in response to information of transmission timings and transmission frequencies supplied from said transmission control means; and

and a receiving device comprising:

(1) reception control means for supplying information of a predetermined reception timing and a predetermined reception frequency for carrying out reception of individual signals transmitted by said plurality of transmission devices in said predetermined transmission timing and said predetermined transmission frequency, said reception timings and said reception frequencies are set in advance to correspond with said transmission timings and said transmission frequencies of said fourth transmission control means;

(2) code division multiplex signal reception means for receiving and demodulating a plurality of transmission signals transmitted with said code-division multiplexing by way of a despreading process according to information of said reception timings and said reception frequencies supplied from said reception control means, and outputting an individual series of extracted demodulated data;

(3) multiple puncturing pattern generation means for generating puncturing patterns, which are identical to the individual puncturing patterns of said plurality of transmission devices;

(4) depuncturing means for depuncturing each of the demodulated data output by said code division multiplex signal reception means by using a puncturing pattern that is identical to the respective one used by each of said plurality of transmission devices among said puncturing patterns supplied from said multiple puncturing pattern generation means, and outputting depunctured data;

(5) combining means for combining said depunctured data output by said depuncturing means, symbol by symbol in a unit of a block, and outputting a result of combining; and

(6) convolutional decoding means for convolution-decoding said result of combining,

wherein said transmission and reception system sets said transmission frequencies approximately equal and selects said transmission timings in a manner not to overlap among said plurality of transmission devices with said transmission control means, and executes transmissions having different timings with respect to one another by punctured-convolution-coding of said information data individually with different puncturing patterns when transmitting said series of data by said plurality of transmission devices; and

said puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural transmission devices by converting at least one of rows, columns and elements of said reference matrix.

44. (New) A transmission and reception system, comprising a transmission device, a plurality of receiving devices for receiving a signal output by said transmission device, and an output processing device for accumulating a series of data received by said plurality of receiving devices, said transmission device comprising:

(1) convolutional coding means for outputting input data by convolution-coding said data;

(2) multiple puncturing pattern generation means for generating and outputting a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said puncturing patterns supplied by said multiple puncturing pattern generation means, and outputting punctured data;

(4) transmission control means for outputting information of transmission timing and transmission frequency for said transmission device; and

(5) modulation / transmission means for modulating and transmitting each of said punctured data supplied from said third puncturing means in response to the information of said transmission timing and said transmission frequency supplied from said transmission control means,

each of said plurality of receiving devices comprising:

(1) reception control means for outputting information of said transmission timing and said transmission frequency for carrying out reception of individual transmission signals addressed to each of said plurality of receiving devices out of a plurality of signals transmitted by said transmission device having said transmission timing and said transmission frequency;

(2) reception / demodulation means for executing reception and demodulation according to information of a reception timing and a reception frequency supplied from said reception control means, and outputting demodulated data;

(3) puncturing pattern generation means for generating a puncturing pattern, which is identical to the puncturing pattern used in the transmission addressed to each of said receiving devices out of said puncturing patterns generated by said multiple puncturing pattern generation means; and

(4) depuncturing means for depuncturing said demodulated data by using the puncturing pattern supplied by said puncturing pattern generation means, and outputting a series of depunctured data, and

said output processing device comprising:

(1) combining means for combining said series of depunctured data obtained by each of said plurality of receiving devices, symbol by symbol in a unit of a block; and

(2) convolutional decoding means for convolution-decoding a result of combining output by said combining means,

wherein the information of said transmission timings supplied by said transmission control means are arranged in a such manner that said individual transmissions do not overlap, and that the transmission frequency are approximately equal among said individual transmissions, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

45. (New) A transmission and reception system, comprising a transmission device, a plurality of receiving devices for receiving a signal output by said transmission device, and an output processing device for accumulating a series of data received by said plurality of receiving devices, said transmission device comprising:

(1) convolutional coding means for outputting input data by convolution-coding said data;

(2) multiple puncturing pattern generation means for generating and outputting a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said puncturing patterns supplied by said multiple puncturing pattern generation means, and outputting punctured data;

(4) transmission control means, in which individual transmission timings are set to be approximately equal and transmission frequencies are selected in a such manner not to overlap a predetermined number of individual transmissions, in advance; and

(5) modulation / transmission means for modulating and transmitting each of said punctured data supplied from said puncturing means in response to the information of said transmission timing and said transmission frequency supplied from said transmission control means,

each of said plurality of receiving devices comprising:

(1) reception control means, in which reception timings and reception frequencies for each of said plurality of receiving devices are set in advance to correspond with said transmission timings and said transmission frequencies assigned for individual ones of said plurality of receiving devices in said transmission control means;

(2) reception / demodulation means for executing reception and demodulation according to information of said reception timing and said reception frequency supplied from said reception control means, and outputting demodulated data;

(3) puncturing pattern generation means for generating a puncturing pattern, which is identical to a respective puncturing pattern used in the transmission addressed to each of said receiving devices out of said puncturing patterns generated by said multiple puncturing pattern generation means; and

(4) depuncturing means for depuncturing said demodulated data by using the puncturing pattern supplied by said puncturing pattern generation means, and outputting a series of depunctured data, and

said output processing device comprising:

(1) combining means for combining said series of depunctured data obtained from each of said plurality of receiving devices, symbol by symbol in a unit of a block; and

(2) convolutional decoding means for convolution-decoding a result of combining output by said combining means,

wherein the information of said transmission timings supplied by said transmission control means are arranged in a such manner that said individual transmissions do not overlap, and that the information of said transmission frequency are approximately equal among said individual transmissions, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

46. (New) A transmission and reception system, comprising a transmission device, a plurality of receiving devices for receiving a signal output by said transmission device, and an output processing device for accumulating a series of data received by said plurality of receiving devices, said transmission device comprising:

(1) convolutional coding means for outputting input data by convolution-coding said data;

(2) multiple puncturing pattern generation means for generating and outputting a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said puncturing patterns supplied by said multiple puncturing pattern generation means, and outputting punctured data;

(4) transmission control means, in which both transmission timings and transmission frequencies are set in advance in such a manner not to overlap a predetermined number of individual transmissions; and

(5) modulation / transmission means for modulating and transmitting each of said punctured data supplied from said puncturing means in response to said transmission timing and said transmission frequency supplied from said transmission control means,

each of said plurality of receiving devices comprising:

(1) reception control means, in which reception timings and reception frequencies for each of said plurality of reception devices are set in advance to correspond with said transmission timings and said transmission frequencies assigned to each of said plurality of reception devices in said transmission control means;

(2) reception / demodulation means for executing reception and demodulation according to information of said reception timing and said reception frequency supplied from said reception control means, and outputting demodulated data;

(3) puncturing pattern generation means for generating a puncturing pattern, which is identical to the puncturing pattern used in the respective transmission addressed to each of said receiving devices out of said puncturing patterns generated by said multiple puncturing pattern generation means; and

(4) depuncturing means for depuncturing said demodulated data by using the puncturing pattern supplied by said puncturing pattern generation means, and outputting a series of depunctured data, and

said output processing device comprising:

(1) combining means for combining said series of depunctured data obtained from each of said plurality of receiving devices, symbol by symbol in a unit of a block; and

(2) convolutional decoding means for convolution-decoding a result of combining output by said combining means,

wherein the information of said transmission timings supplied by said transmission control means are arranged in a such manner that said individual transmissions do not overlap, and that the information of said transmission frequency are approximately equal among said individual transmissions, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

47. (New) A transmission and reception system, comprising a transmission device, a plurality of receiving devices for receiving a signal output by said transmission device, and an output processing device for accumulating a series of data received by said plurality of receiving devices, said transmission device comprising:

(1) convolutional coding means for outputting input data by convolution-coding said data;

(2) multiple puncturing pattern generation means for generating and outputting a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said puncturing patterns supplied by said multiple puncturing pattern generation means, and outputting punctured data;

(4) transmission control means, in which both transmission timings and transmission frequencies are set to be approximately equal among a predetermined number of individual transmissions;

(5) code division multiplex signal transmission means for modulating and transmitting said punctured data with code division multiplexing in response to information of transmission timings and transmission frequencies supplied from said transmission control means;

each of said plurality of receiving devices comprising:

(1) reception control means, in which reception timing and reception frequency for each of said plurality of receiving devices are set to correspond with said transmission timings and said transmission frequencies of said transmission control means; and

(2) code division multiplex signal reception means for receiving and demodulating said signals transmitted with code-division multiplexing by extracting only a signal addressed to each of said plurality of receiving devices according to information of the reception timings and the reception frequencies supplied from said reception control means, and outputting demodulated data;

(3) puncturing pattern generation means for generating a puncturing pattern, which is identical to the puncturing pattern used in the respective transmission addressed to each of said plurality of receiving devices out of said puncturing patterns generated by said multiple puncturing pattern generation means; and

(4) depuncturing means for depuncturing said demodulated data by using the puncturing pattern supplied by said puncturing pattern generation means, and outputting a series of depunctured data, and

said output processing device comprising:

(1) combining means for combining said depunctured data obtained by each of said plurality of receiving devices, symbol by symbol in a unit of a block; and

(2) convolutional decoding means for convolution-decoding a result of combining output by said combining means,

wherein the information of said transmission timings supplied by said transmission control means are arranged in a such manner that said individual transmissions do not

overlap, and that the information of said transmission frequency are approximately equal among said individual transmissions, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

48. (New) A transmission and reception system comprising a transmission earth station, a receiving earth station, and a plurality of satellite repeater stations, wherein communication is made from said transmission earth station to said receiving earth station via said plurality of satellite repeater stations, said transmission earth station being provided with an earth station transmission device comprising:

(1) convolutional coding means for outputting input data by convolution-coding said data;

(2) first multiple puncturing pattern generation means for generating puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting punctured data; and

(4) earth station modulation / transmission means for transmitting each of said punctured data output by said puncturing means to said plurality of satellite repeater stations, one series of data after another, and

said receiving earth station being provided with an earth station reception device comprising:

(1) earth station reception / demodulation means for receiving individual signals transmitted from said transmission earth station via said plurality of satellite repeater stations, and outputting demodulated data;

(2) second multiple puncturing pattern generation means for generating puncturing patterns, which are identical to the puncturing patterns of said first multiple puncturing pattern generation means;

(3) depuncturing means for depuncturing each of said demodulated data output from said earth station reception / demodulation means by using each of said puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting the depunctured data;

(4) combining means for combining the depunctured data output by said depuncturing means, symbol by symbol in a unit of a block, and outputting a result of combining; and

(5) convolutional decoding means for convolution-decoding said result of combining output by said combining means, and outputting a decoded data,

wherein said transmission and reception system punctured-convolution-codes identical series of information data with different forms of puncturing patterns, and executes path-diversity transmission and reception of an obtained plurality of different series of error-correction code words, as individual diversity branch data via said plurality of satellite repeater stations, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

49. (New) A transmission and reception system comprising a plurality of earth stations and a plurality of satellite repeater stations, wherein said plurality of earth stations

communicate with one another via said plurality of satellite repeater stations, and each of said plurality of earth stations comprises:

an earth station transmission device comprising:

(1) convolutional coding means for outputting input data by convolution-coding said data;

(2) first multiple puncturing pattern generation means for generating puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting punctured data; and

(4) earth station modulation / transmission means for transmitting each of said punctured data output by said puncturing means to said plurality of satellite repeater stations, one series of data after another, and

an earth station reception device comprising:

(1) earth station reception / demodulation means for receiving individual signals transmitted from said transmission earth station via said plurality of satellite repeater stations, and outputting of demodulated data;

(2) second multiple puncturing pattern generation means for generating puncturing patterns, which are identical to the puncturing patterns of said first multiple puncturing pattern generation means;

(3) depuncturing means for depuncturing each of said demodulated data output from said earth station reception / demodulation means by using each of said puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting the depunctured data;

(4) combining means for combining the depunctured data output by said depuncturing means, symbol by symbol in a unit of a block, and outputting a result of combining; and

(5) convolutional decoding means for convolution-decoding said result of combining output by said combining means, and outputting a decoded data,

wherein said transmission and reception system punctured-convolution-codes identical series of information data with different forms of puncturing patterns, and executes path-diversity transmission and reception of an obtained plurality of different series of error-correction code words, as individual diversity branch data via said plurality of satellite repeater stations, and

said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plural form by converting at least one of rows, columns and elements of said reference matrix.

50. (New) A transmission device comprising:

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) puncturing means for puncturing said convolution-coded data using puncturing patterns, and outputting punctured data; and

(3) modulation / transmission means for modulating and transmitting said punctured data,

wherein said puncturing means provides a reference matrix for generating a plural form of said puncturing patterns having an identical puncturing rate, but respectively different block patterns.

51. (New) A transmission device including:

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) first multiple puncturing pattern generation means for generating a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) first puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said plural form of puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting a plural form of punctured data;

(4) modulation / transmission means for modulating and transmitting said each form of punctured data output by said first puncturing means by using each of branches, as transmission data.

52. (New) The transmission device according to claim 51, wherein said first multiple puncturing pattern generation means comprises a first reference matrix generation means for generating a reference matrix for one of said puncturing patterns, and a first matrix conversion means for outputting a different puncturing pattern for each one of a plurality of branches by converting at least one of rows, columns and elements of said reference matrix.

53. (New) A receiving device comprising:

(1) reception / demodulation means for receiving and demodulating a signal transmitted by a transmission source via a communication pathway, and outputting demodulated data, said transmission source providing a reference matrix from which are generated puncturing patterns;

(2) depuncturing means for depuncturing said demodulated data using puncturing patterns of said transmission source, and outputting a plural variety of series of depunctured data;

(3) combining means for combining said series of depunctured data, and outputting a result of combining; and

(4) convolutional decoding means for convolution-decoding said result of combining, and outputting a decoded data.

54. (New) A receiving device comprising:

(1) reception / demodulation means for receiving and demodulating each of the signals transmitted by said transmission device by using each of branches, and outputting demodulated data;

(2) second multiple puncturing pattern generation means for generating a plural form of puncturing patterns, which are identical to the puncturing patterns generated by said first multiple puncturing pattern generation means;

(3) first depuncturing means for depuncturing each of demodulated data in quantity corresponding to the number of said branches output from said reception / demodulation means by using the puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting depunctured data;

(4) first combining means for combining each of depunctured data output by said first depuncturing means, symbol by symbol in a unit of block, and outputting a result of combining; and

(5) first convolutional decoding means for convolution-decoding said result of combining, and outputting decoded data.

55. (New) A transmission and reception device comprising a transmitter and receiver, said transmitter comprising;

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) puncturing means for puncturing said convolution-coded data using puncturing patterns, and outputting punctured data; and

(3) modulation / transmission means for modulating and transmitting said punctured data, and

said receiver comprising:

(1) reception / demodulation means for receiving and demodulating a signal transmitted by said transmission device, and outputting demodulated data;

(2) depuncturing means for depuncturing said demodulated data using said puncturing patterns used by said puncturing means, and outputting depunctured data;

(3) combining means for combining said depunctured data, and outputting a result of combining; and

(4) convolutional decoding means for convolution-decoding said result of combining, and outputting a decoded data,

wherein said puncturing means provides a reference matrix for generating a plural form of said puncturing patterns having an identical puncturing rate, but respectively different block patterns.

56. (New) A transmission and reception device comprising a transmitter and receiver, said transmitter comprising;

(1) convolutional coding means for convolution-coding input data, and outputting convolution-coded data;

(2) first multiple puncturing pattern generation means for generating a plural form of puncturing patterns having an identical puncturing rate, but having respectively different puncturing block patterns, said first multiple puncturing pattern generation means providing a reference matrix from which are generated said puncturing patterns;

(3) first puncturing means for puncturing convolution-coded data output by said convolutional coding means by using each of said plural form of puncturing patterns supplied by said first multiple puncturing pattern generation means, and outputting a plural form of punctured data;

(4) modulation / transmission means for modulating and transmitting said each form of punctured data output by said first puncturing means by using each of branches, as transmission data, and

said receiver comprising:

(1) reception / demodulation means for receiving and demodulating each of the signals transmitted by said transmission device by using each of branches, and outputting demodulated data;

(2) second multiple puncturing pattern generation means for generating a plural form of puncturing patterns, which are identical to the puncturing patterns generated by said first multiple puncturing pattern generation means;

(3) first depuncturing means for depuncturing each of demodulated data in quantity corresponding to the number of said branches output from said reception / demodulation means by using the puncturing patterns supplied by said second multiple puncturing pattern generation means, and outputting depunctured data;

(4) first combining means for combining each of depunctured data output by said first depuncturing means, symbol by symbol in a unit of block, and outputting a result of combining; and

(5) first convolutional decoding means for convolution-decoding said result of combining, and outputting decoded data.

57. (New) A method of transmission and/or reception comprising at least one of a process (a) and a process (b), said process (a) comprising the steps of:

(1) convolution-coding input data, and outputting convolution-coded data;

(2) puncturing said convolution-coded data by using puncturing patterns, and outputting punctured data, said puncturing patterns generated from a reference matrix, wherein this process comprises the steps of (i) for generating a reference matrix for one of said puncturing patterns, and (ii) for outputting a different puncturing pattern for each one

of a plural form by converting at least one of rows, columns and elements of said reference matrix; and

(3) modulating and transmitting said of punctured data via at least one communication pathway, and

said process (b) comprising the steps of:

(1) receiving and demodulating a signal transmitted via said communication pathway, and outputting demodulated data;

(2) depuncturing said demodulated data by using puncturing patterns that are identical to said puncturing patterns used in said step of puncturing, and outputting depunctured data;

(3) combining said depunctured data, and outputting a result of combining; and

(4) convolution-decoding said result of combining, and outputting decoded data.